Turning Resistance into a Driving Force: The Effectiveness and Mechanism of Reverse Mentoring in Enterprise Digital Transformation

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Abstract

In the context of rapid digital technology advancement, enterprise digital transformation has become an inevitable trend. However, many enterprises' digital transformation initiatives face severe internal personnel resistance, often resulting in transformation failure. Current research on mitigating such personnel resistance remains limited. This study addresses this critical practical challenge and innovatively proposes reverse mentoring as a potential "key to the solution," examining the effectiveness and mechanisms of reverse mentoring in mitigating personnel resistance to enterprise digital transformation. First, this study extends the conceptualization of reverse mentoring grounded in the digital transformation context and develops corresponding measurement instruments. Building on this, from a differentiated need satisfaction perspective, it constructs a theoretical model in which reverse mentoring, by satisfying the core needs of different stakeholders (older mentees, younger mentors, and organizational human resources as a whole) in digital transformation, facilitates their adaptation and actively promotes digital transformation. Thus, this study not only advances micro-level personnel management research on enterprise digital transformation, but also deepens the academic understanding of the systematic effects of reverse mentoring, providing insights and references for enterprises to successfully implement digital transformation and effectively apply reverse mentoring practices.

Full Text

Turning Resistance into Assistance: The Effectiveness and Mechanism of Reverse Mentoring in Enterprise Digital Transformation

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Abstract

Against the backdrop of rapid digital technology development, enterprise digital transformation has become an inevitable trend. However, many enterprises face serious internal personnel resistance during their digital transformation journey, often leading to transformation failure. Current research on how to resolve such personnel resistance remains limited. This study focuses on this critical practical challenge and innovatively proposes reverse mentoring as a potential "key to the solution," aiming to explore the effectiveness and mechanism of reverse mentoring in resolving personnel resistance in enterprise digital transformation. First, we seek to expand the conceptual connotation of reverse mentoring by grounding it in the contemporary context of digital transformation and develop corresponding measurement instruments. Building upon this foundation, from the perspective of differentiated needs satisfaction, we construct a theoretical model wherein reverse mentoring helps different subjects (older protégés, younger mentors, and organizational human resources as a whole) adapt well to and actively promote digital transformation by satisfying their core needs in this process. Theoretically, this study not only advances micro-level personnel management research in enterprise digital transformation but also deepens academic understanding of the regular patterns of reverse mentoring effectiveness. Practically, it assists enterprises in successfully implementing digital transformation and leveraging the benefits of reverse mentoring.

Keywords: reverse mentoring, digital transformation, needs satisfaction, personnel resistance
Classification Code: B849: C93

1. Problem Statement

Along with the rapid development and widespread application of digital technologies represented by big data, the Internet of Things, cloud computing, and artificial intelligence, the digital economy has become a crucial "engine" driving high-quality economic development in China (Qi Yudong et al., 2021). According to estimates, in 2023, China' s digital economy accounted for over 40% of GDP, with digital economic growth contributing nearly 70% to overall economic

growth. Driven by the tide of the digital economy, digital transformation has become an inevitable choice for all industries to enhance competitiveness and create new value. Data shows that over 80% of enterprises have already embarked on digital transformation, with the proportion of enterprises with more than 10,000 employees implementing digital transformation reaching 92.3% (Zhou Qiwei et al., 2024). However, despite strong momentum in promoting digital transformation, the digital transformation journey for most enterprises is not smooth. A global survey indicates that the failure rate of general enterprise digital transformation actually exceeds 80%[1]. Research finds that the reasons for transformation failure are complex and diverse, among which internal personnel resistance is a common challenge faced by many enterprises[2]. This is mainly manifested as: older employees in organizations often have shortcomings in technology adaptation, lack sufficient digital literacy and identification with new technologies, leading to negative attitudes toward transformation (Vuchkovski et al., 2023; Zahoor et al., 2023); while younger employees, despite having strong technical capabilities, often lack motivation during digital transformation due to shallow seniority and insufficient participation opportunities (Agrawal, 2017; Weeks & Schaffert, 2019); in addition, beyond different age groups, organizational human resources as a whole also face issues such as lacking consensus on digital transformation, resulting in weak cohesion and difficulty in coping with setbacks and challenges during transformation (Yao et al., 2024). Therefore, how to resolve personnel resistance in enterprise digital transformation has become critical to ensuring transformation success.

Personnel resistance in digital transformation is fundamentally related to the dissemination and application of new technologies. Digital transformation requires enterprises to fundamentally improve business models and processes through digital technologies, thereby enhancing overall business performance (Abhari et al., 2021). In this process, enterprises need to help employees quickly master new technologies and apply them to work scenarios. However, in a rapidly changing technological environment, this goal is not easily achieved. In previous organizational knowledge management practices, mentoring, as a mature management approach, has been widely used to promote the inheritance of knowledge and skills. Traditional mentoring typically involves experienced older employees serving as mentors, providing guidance and advice to younger employees (Ivey & Dupré, 2022; Kram, 1985). This model has proven effective in stable organizational environments, particularly in imparting vocational skills, cultural values, and daily work techniques (Hunt & Michael, 1983). However, in the rapidly iterative digital context, the limitations of traditional mentoring are increasingly apparent: First, traditional mentoring fails to effectively address the technical shortcomings faced by older employees in digital transformation. Although older employees have rich work experience, they often struggle to keep pace with technological innovation, not only failing to provide effective technical guidance to younger employees but even needing to rely on younger employees for technical support (Evans, 2017), rendering the traditional one-way knowledge transfer model inadequate in rapidly changing technological environments;

Second, traditional mentoring cannot truly stimulate the enthusiasm and proactivity of younger employees in digital transformation. Despite younger employees having strong digital technology capabilities, the hierarchical relationships and fixed roles of traditional mentoring limit their creativity and sense of participation, leading to insufficient proactive involvement in the transformation process (Twenge et al., 2010); Finally, traditional mentoring struggles to continuously promote intergenerational communication and collaboration in digital transformation. Against the backdrop of increasingly prominent intergenerational cultural differences, especially as younger generations increasingly favor egalitarian and interactive work cultures, the inherent authority and hierarchical structure of traditional mentoring may exacerbate intergenerational divides, thereby inhibiting effective communication and cooperation and weakening overall organizational cohesion (Deng Benchi et al., 2018). These limitations indicate that traditional mentoring' s personnel training and collaboration models are gradually becoming ineffective in digital transformation, struggling to cope with and potentially even exacerbating personnel resistance, urgently requiring innovation and breakthrough.

Reverse mentoring offers a potential solution to these challenges. As an innovative knowledge management and talent development model, reverse mentoring involves younger employees serving as mentors to impart new technology knowledge to older employees (Murphy, 2012). This model aims to break knowledge barriers and bridge intergenerational technology gaps through two-way interaction and intergenerational cooperation, theoretically making it particularly suitable for addressing personnel resistance issues in digital transformation. For example, through reverse mentoring, younger employees can leverage their technical advantages to help older employees quickly acquire cutting-edge digital technologies and emerging tools, effectively addressing older employees'technical shortcomings and making technology dissemination more efficient and smooth; simultaneously, reverse mentoring provides younger employees with opportunities to exert influence (Twenge, 2006), enhancing their sense of responsibility and participation in digital transformation. This sense of participation can stimulate younger employees' enthusiasm, making them more proactively engaged in the transformation process; additionally, reverse mentoring can deepen organizational members' identification with and understanding of transformation goals, enhance cohesion during change, thereby promoting the consolidation of transformation consensus and improving overall organizational transformation adaptability through promoting intergenerational collaboration and communication. In fact, the earliest reverse mentoring practices were indeed closely related to new technology changes. In 1999, Jack Welch, then CEO of General Electric, realized that the company' s senior members had fallen behind in the face of Internet technology and urgently needed to learn from younger employees. He therefore paired 500 new and old employees, with younger employees imparting network technology and the values and thinking patterns of the new generation to older employees, helping GE achieve industry leadership in the Internet technology revolution.

Although reverse mentoring appears to be well-suited to the needs of digital transformation, existing research attention remains insufficient. At the practical level, reverse mentoring has achieved remarkable results in some enterprises. For example, the aforementioned GE case demonstrates that this model can help organizations break intergenerational knowledge barriers and improve employees' adaptability to new technologies. However, these practical experiences have not been sufficiently theorized, making it difficult to provide systematic guidance for broader management applications. From an academic research perspective, existing studies remain at the stage of conceptual discussion or case analysis, failing to conduct systematic and in-depth theoretical construction and empirical verification of reverse mentoring' s structural connotation, mechanism, and implementation effects (Murphy, 2012). Especially against the backdrop of digital transformation, where organizational models and work content have undergone structural changes, requiring significant adjustments in employees' cognition, psychology, and behavior, posing new requirements for organizational talent development approaches (Gao Zhonghua, Xu Yan, 2023). Correspondingly, the theoretical connotation of reverse mentoring also needs to be updated and developed to keep pace with contemporary characteristics. Additionally, as a new knowledge management and talent development model, whether and how reverse mentoring can function in digital transformation scenarios remains to be tested. Therefore, deeply exploring the theoretical connotation of reverse mentoring in the digital transformation context, as well as its effectiveness and mechanism in resolving transformation personnel resistance, not only helps fill theoretical gaps in current research but also provides scientific guidance for enterprises to address management challenges in digital transformation, thereby promoting the application and development of reverse mentoring in the new era.

In summary, to solve the problem of personnel resistance in enterprise digital transformation, this study intends to explore the impact of reverse mentoring on the digital transformation adaptability of different internal subjects from the perspective of differentiated needs satisfaction. Given that older employees, younger employees, and organizational human resources as a whole have different shortcomings and needs in digital transformation, we believe that reverse mentoring can resolve personnel resistance in transformation by simultaneously satisfying these differentiated needs. Therefore, the perspective of differentiated needs satisfaction provides an integrated theoretical framework for us to understand this issue. Specifically, first, based on the application scenario of enterprise digital transformation, we will systematically sort out the connotation, characteristics, and structure of reverse mentoring through the classic grounded theory approach and develop corresponding measurement scales. Second, from the perspective of satisfying older employees' core needs for digital technology, we reveal the theoretical mechanism through which reverse mentoring influences older protégés' digital transformation adaptability. Third, from the perspective of satisfying younger employees' core needs for motivational incentives, we reveal the theoretical mechanism through which reverse mentoring influences younger mentors' digital transformation adaptability. Finally, from the perspective of

satisfying organizational human resources' core need for consensus building as a whole, we explore the theoretical mechanism through which reverse mentoring influences organizational digital transformation resilience.

2.1 Concept, Characteristics, and Functions of Reverse Mentoring

First, the concept of reverse mentoring. Reverse mentoring is a guidance practice relative to traditional mentoring. Traditionally, mentoring relationships involve older, more experienced, senior personnel providing guidance and advice to younger, inexperienced, junior colleagues (Ivey & Dupré, 2022; Kram, 1985). Reverse mentoring overturns this formula, allowing younger junior employees to serve as mentors, sharing professional knowledge and new-generation insights with older senior colleagues as protégés (Murphy, 2012). Thus, the key difference between reverse mentoring and traditional mentoring lies in the structural role reversal, where the protégé rather than the mentor holds a higher position in the organizational hierarchy. This unique power structure gives reverse mentoring distinctive characteristics and unique functions.

Second, the characteristics of reverse mentoring. First, mentor-protégé status. In traditional mentoring, mentors typically hold higher organizational status than protégés (Han Yi, Yang Baiyin, 2012), whereas in reverse mentoring, protégés have higher status and power relative to mentors. This structural role reversal brings unique challenges, including requiring protégés to humble themselves and "learn from those below" and requiring mentors to muster the courage to "dare to teach those above." Second, initiation methods. The power structure of traditional mentoring aligns with the organization' s normal power structure, so it can be formally initiated by the organization or spontaneously formed through individual interests. In contrast, because reverse mentoring' s power structure is disruptive, it typically requires formal organizational initiation to form. Third, learning forms. Learning in traditional mentoring is typically one-way, with mentors imparting professional knowledge and providing career development support to protégés (Hunt & Michael, 1983); whereas learning in reverse mentoring can be two-way: on one hand, protégés can learn cutting-edge technologies and new-generation perspectives from mentors (Harvey et al., 2009), and on the other hand, mentors can also learn about company traditions, organizational politics, and business processes from protégés (Wanberg et al., 2003). Fourth, relationship nature. In traditional mentoring, typically only protégés benefit more (Han Yi et al., 2013); whereas in reverse mentoring, both mentors and protégés benefit significantly. Older protégés can learn about the latest technologies and the attitudes and behaviors of new-generation consumers and employees that accompany new technologies from reverse mentors; meanwhile, younger mentors can work with experienced older colleagues, gain recognition, and develop leadership skills.

Third, the functions of reverse mentoring. As a special developmental guidance practice, reverse mentoring can simultaneously support the develop-

ment of both mentors and protégés, which differs from traditional mentoring whose functions primarily aim to promote protégé growth. Additionally, there are significant differences in sub-functions between reverse mentoring and traditional mentoring. It is generally believed that traditional mentoring has two main functions: mentors providing career support and psychological support to protégés. Career support includes sponsorship, coaching, exposure, protection, and challenging task assignments, while psychological support includes role modeling, acceptance and recognition, friendship, and counseling (Kram, 1985; Noe, 1988). Recent research has also treated role modeling as a third function parallel to career support and psychological support, rather than as a sub-function of psychological support (Pellegrini & Scandura, 2005; Scandura, 1992). Murphy' s (2012) theoretical article argues that reverse mentoring also possesses these three functions, but due to significant differences in structure and purpose, the specific sub-functions may differ. For example, one of the most significant and important functions of reverse mentoring is leveraging younger mentors' advantages to share cutting-edge technology knowledge and new-generation insights with older protégés, which is not within the design considerations of traditional mentoring systems (Harvey et al., 2009).

With the deepening of enterprise digital transformation, the theoretical connotation and practical forms of reverse mentoring also urgently need updating and development. Reverse mentoring, which originated from the Internet technology revolution, has shown effectiveness in solving problems such as intergenerational knowledge transfer and skill updating. However, with the rapid iteration of emerging digital technologies such as big data, artificial intelligence, and cloud computing, employees' competency structures face new challenges, and internal work patterns and collaboration methods within enterprises have also undergone profound changes (Xie Xiaoyun et al., 2021; Zhang Zhixue et al., 2021). Digital transformation not only requires enterprises to impart technical knowledge but also emphasizes enhancing employees' digital thinking and innovation capabilities to adapt to increasingly complex work environments. Meanwhile, the application of digital platforms and advanced technologies has driven the transformation of knowledge transfer methods from traditional face-to-face communication to more flexible remote interaction, virtual collaboration, and online learning. Additionally, the widespread application of technologies such as intelligent platforms, online tools, and data analytics has greatly improved the efficiency and precision of knowledge transfer. Therefore, the guidance content, interaction patterns, and technology applications of reverse mentoring all face corresponding adjustments to adapt to the new opportunities and challenges brought by digital transformation. However, the practical connotation of existing reverse mentoring has not been updated with changing times, and lacks corresponding measurement tools and evaluation methods, resulting in related research not yet forming a theoretical system that can be widely referenced. To this end, we urgently need to redefine the theoretical connotation of reverse mentoring and develop new measurement tools and methods adapted to the digital transformation context to promote the further development and application of

this model.

2.2 Relationship Between Reverse Mentoring and Digital Transformation

To date, research in the mentoring field has primarily focused on exploring the effectiveness of traditional mentoring (e.g., Deng et al., 2024; Li Jinsheng et al., 2021; Wei Xiangyu, Yu Guangtao, 2021). However, the digital transformation era has posed entirely new challenges to this model, making the limitations of traditional mentoring increasingly prominent. On one hand, traditional mentoring shows obvious limitations in meeting the needs for disseminating cutting-edge digital technology knowledge. Traditional mentoring uses older and senior employees as mentors and younger and junior employees as protégés. This top-down knowledge transfer model is more applicable in stable organizational environments. However, in the digital transformation context, the update cycle of new technologies has significantly shortened, and younger employees often have advantages over older employees in using digital tools and grasping technology trends. Due to over-reliance on traditional experience, older employees have lower acceptance of new technologies and may even develop resistance psychology (Vuchkovski et al., 2023; Zahoor et al., 2023). This results in the traditional top-down one-way knowledge transfer model being unable to meet the dynamic and rapid knowledge interaction needs in digital transformation, leading to intensified intergenerational technology gaps and hindering the popularization of technology application and overall organizational transformation adaptability.

On the other hand, traditional mentoring is insufficient in stimulating younger employees' creativity and sense of participation (Murphy, 2012). Traditional mentoring emphasizes hierarchical guidance relationships in its power structure, which reinforces hierarchical culture in organizations and weakens collaborative spirit and innovation atmosphere among employees. Especially when facing intergenerational cultural differences and personalized needs of new-generation employees, the traditional top-down guidance model lacks flexibility and may not adapt to new-generation employees' preference for more egalitarian and interactive communication. For example, research shows that new-generation employees desire more voice in knowledge sharing and collaboration, while strict hierarchical order often inhibits their active participation (Twenge et al., 2010). Additionally, traditional mentoring may also lead to negative mentoring experiences due to unbalanced power relationships, including tense mentor-protégé relationships, communication barriers, and deviations in knowledge transfer, which not only weakens knowledge sharing efficiency but may also negatively impact employees' psychological health and work attitudes (Deng Benchi et al., 2018).

The above analysis indicates that relying solely on traditional mentoring can no longer effectively address knowledge transfer and talent development needs in the new situation. In this context, reverse mentoring has gradually entered

practical and academic 视野. Preliminary research evidence suggests that reverse mentoring, as an innovative knowledge management and talent development practice, not only brings significant benefits to older protégés and younger mentors but also has positive impacts on the organization as a whole. For example, the theoretical study by Chaudhuri and Ghosh (2012) argues that reverse mentoring, as a special social exchange tool, can simultaneously help improve work engagement among Baby Boomers and organizational commitment among Millennials. Murphy' s (2012) theoretical article points out that benefits of reverse mentoring for older protégés include acquiring cutting-edge technology, enhanced contact with younger colleagues, improved relational learning, and increased social capital. Benefits of reverse mentoring for younger mentors include enhanced leadership skills, acquisition of organizational knowledge, enhanced contact with older colleagues, improved personal/relational learning, and increased social capital. At the organizational level, reverse mentoring helps improve talent management, promote employee recruitment and retention, enhance organizational justice and diversity, bridge intergenerational technology gaps, and accelerate innovation and learning (Jordan & Sorell, 2019). Additionally, as a representative of the few empirical studies in this field, Garg et al. (2021) developed a unidimensional scale for reverse mentoring, proving that it significantly improves younger mentors' work engagement and performance while reducing work withdrawal behaviors. Lü Hongjiang et al. (2020), based on the concept of "reverse guidance," used social network analysis to verify that leaders proactively seeking advice from subordinates can enhance information deep processing capabilities, thereby improving self-efficacy. These results indicate that reverse mentoring has initially demonstrated its potential in promoting intergenerational knowledge sharing and talent development.

Beyond the above impacts, with increasing enterprise needs for change management, the application scope of reverse mentoring has been further expanded, demonstrating its unique value in promoting organizational culture, management model, and technological changes. Existing literature shows that by promoting two-way exchange of intergenerational knowledge and experience, reverse mentoring can effectively drive change implementation and enhance organizational members' acceptance of change (Burhan et al., 2024). For example, in organizational culture change, reverse mentoring is widely used to enhance leadership' s understanding of diversity and inclusion issues. Through younger mentors' perspectives, senior managers can better perceive and adapt to new-generation employees' cultural values, thereby promoting inclusive development of organizational culture (Jordan & Sorell, 2019). In management model change, reverse mentoring enables senior managers to understand new management trends such as flexible work models and transparent communication from younger employees' feedback, which not only promotes modernization of management approaches but also enhances employees' sense of belonging and participation (Chaudhuri & Ghosh, 2012). Additionally, reverse mentoring performs particularly prominently in technological change, with its significant contribution manifested in bridging technology gaps, helping senior employees

master cutting-edge technologies, and promoting technology application in business (Murphy, 2012; Jordan & Sorell, 2019).

Digital transformation, as a complex and profound organizational change, is not only a disruptive technological revolution but also requires profound transformation of organizational culture and management models (Imran et al., 2021). Compared to other types of organizational change, the challenge of digital transformation lies in the rapid iteration of technology and the deep integration between new technologies and corporate culture and management processes. This comprehensive change attribute suggests that reverse mentoring may play a greater role in digital transformation. On one hand, reverse mentoring can help older employees quickly master new technologies through younger mentors' technical expertise, reducing uncertainty in technology adoption within the organization; on the other hand, it also promotes leaders' more acute perception of new management needs and cultural change trends in the digital era through deep intergenerational exchange, thereby providing the organization with management capabilities and innovative culture needed to adapt to the digital environment. However, regrettably, there is currently a lack of direct evidence regarding the effectiveness and mechanism of reverse mentoring in enterprise digital transformation change, urgently awaiting further development in management practice and breakthrough innovation in theoretical research.

2.3 Research Progress Review

Overall, reverse mentoring, as a cutting-edge management practice, has gradually attracted academic attention due to its unique functions that transcend traditional mentoring. However, current research in this field is still in a very initial stage, greatly lagging behind the development of management practice.

First, the connotation and measurement of reverse mentoring need updating. Current academic understanding of reverse mentoring is mainly based on a few theoretical literature pieces such as Murphy (2012), and these discussions of reverse mentoring are primarily based on academic theoretical deduction, whose accuracy remains to be verified. Particularly importantly, mentoring practice is highly era-specific and contextual (Gao Zhonghua, Xu Yan, 2023). With the rise of digital technology change, work content and work relationships have undergone profound changes, and the practical content of reverse mentoring will also change accordingly. Therefore, it is necessary to re-examine, update, and expand the structural connotation of reverse mentoring in the digital transformation context. Additionally, there is currently a lack of reliable measurement tools for reverse mentoring. For example, the unidimensional scale developed by Garg et al. (2021) does not reflect the three-dimensional functions of reverse mentoring proposed by Murphy (2012), and its reliability has not been widely tested. Meanwhile, Lü Hongjiang et al.' s (2020) operationalization based on consulting networks is only an indirect measurement method that does not directly reflect the concept of reverse mentoring. Therefore, it is necessary to systematically explore the functional connotation of reverse mentoring in spe-

cific contexts through rigorous qualitative research procedures and develop reliable measurement tools based on this foundation, laying the groundwork for subsequent empirical research.

Second, the effectiveness of reverse mentoring still lacks empirical evidence. As can be seen from the literature review, although reverse mentoring has significant practical application, academic research on reverse mentoring in the management field is still very limited, especially lacking empirical evidence (Murphy, 2012). Although existing theoretical research indicates that reverse mentoring may produce positive effects in intergenerational knowledge transfer, skill enhancement, and organizational human resource development, these theoretical analyses have not yet undergone large-scale, in-depth empirical testing and cannot truly reflect its application effects in management practice. Enterprise digital transformation provides an excellent application scenario for reverse mentoring. Whether and how reverse mentoring can help different internal subjects adapt well to and actively promote transformation change in the digital transformation context is an important issue that urgently needs to be addressed and has significant practical implications. However, current academic attention to this issue lacks systematic exploration. Given that different subjects have different needs in digital transformation—for example, older employees urgently need guidance in digital technology, younger employees desire more voice in transformation, and organizational human resources as a whole need to build transformation consensus—and previous scholars have also pointed out that whether reverse mentoring can achieve expected effects depends on its ability to simultaneously satisfy the differentiated needs of different groups (Chaudhuri & Ghosh, 2012), differentiated needs satisfaction may be a feasible research perspective for understanding the above issues. Future research can follow this line of thinking to deeply reveal the impact effects, mechanisms, and boundary conditions of reverse mentoring, providing theoretical basis and practical guidance for enterprises to better utilize reverse mentoring in digital transformation.

3 Research Proposal

This study focuses on the practical pain point of internal personnel resistance faced by enterprises in digital transformation, proposes reverse mentoring as a potential "key to the solution," and aims to explore the effectiveness and mechanism of reverse mentoring in resolving personnel resistance in digital transformation. As shown in Figure 1 [Figure 1: see original paper], Study 1 first clarifies the functional connotation of reverse mentoring and develops corresponding measurement scales; Study 2 constructs a theoretical model based on the Technology Acceptance Model to reveal the mechanism through which reverse mentoring influences older protégés' digital transformation adaptability; Study 3 constructs a theoretical model based on Self-Determination Theory to reveal the mechanism through which reverse mentoring influences younger mentors' digital transformation adaptability; Study 4 constructs a theoretical model based on Sensemaking Theory to reveal the mechanism through which reverse

mentoring influences organizational digital transformation resilience.

3.1 Study 1: Structural Connotation and Scale Development of Reverse Mentoring Practice

Reverse mentoring, as a "key" proposed in this study to solve the problem of personnel resistance in enterprise digital transformation, is the core concept of the project. The main purpose of Study 1 is to clarify the structural connotation of reverse mentoring practice and develop corresponding measurement scales, providing rich practical evidence and reliable research tools for subsequent studies. Although previous research has preliminarily explored the structural connotation of reverse mentoring, these discussions are more theoretical and have not undergone rigorous construct development procedures. Meanwhile, there is currently a lack of reliable measurement tools for reverse mentoring. For example, the unidimensional scale developed by Garg et al. (2021) does not reflect the three-dimensional functions of reverse mentoring proposed by Murphy (2012), and its reliability has not been verified. Additionally, and most importantly, current academic discussions of reverse mentoring primarily position it as a general management practice without considering its targeted nature (targeted mentorship program, Lester et al., 2011), which does not align with the practical application of reverse mentoring in reality. For example, GE' s earliest reverse mentoring practice was designed closely around the practical goal of promoting Internet technology change. In view of this, this study will closely focus on the specific application scenario of enterprise digital transformation to explore the structural connotation of reverse mentoring practice in this context and develop measurement tools, effectively enhancing the relevance and effectiveness of the practice.

Based on literature review and preliminary research of this study, reverse mentoring practice may include the three functional dimensions of career support, psychological support, and role modeling proposed by Murphy (2012), but the specific connotation should be closely related to the context of enterprise digital transformation. For example, career support focuses on younger mentors sharing digital technology knowledge and new-generation insights on digital technology development trends with older protégés (Harvey et al., 2009); psychological support includes younger mentors providing psychological support to older protégés to cope with psychological challenges brought by digital transformation; role modeling is reflected in younger mentors setting behavioral examples for older protégés on how to learn new digital technologies and adapt to new technology changes. Of course, the specific structural connotation remains to be deeply explored. Subsequently, this study plans to systematically explore the functions of reverse mentoring through rigorous qualitative research procedures and develop reliable measurement tools based on this foundation, laying the groundwork for subsequent empirical research.

3.2 Study 2: Mechanism of Reverse Mentoring' s Influence on Older Protégés' Digital Transformation Adaptability

From literature review, we know that employees from different generations have different shortcomings and needs in enterprise digital transformation, leading to differences in their attitudes toward digital transformation. For older employees, their biggest problem is severe digital literacy deficiency, making it difficult for them to adapt to work changes brought by digital technology transformation, and thus they may hold negative attitudes toward enterprise digital transformation (Vuchkovski et al., 2023; Zahoor et al., 2023). Subjective attitudes not only reflect employees' emotional and cognitive evaluation of digital transformation but may also directly influence their actual skill learning and adaptive behaviors. Existing research shows that employees' attitudes toward digital transformation directly affect their behavioral performance in actual work, such as whether they are willing to actively adopt new technologies or promote process optimization. When employees hold positive attitudes toward digital transformation, they are more likely to exhibit constructive adaptive behaviors; whereas employees with negative attitudes or resistance to change may cause delays or even hindrance in the transformation process (Zhou Qiwei et al., 2024). Therefore, transforming employees' attitudes toward digital transformation is key to guiding this attitude transformation into adaptive behaviors, thereby effectively resolving personnel resistance.

From the perspective of needs satisfaction, this study believes that reverse mentoring can satisfy older protégés' core needs for digital technology, thereby influencing their attitudes toward digital transformation, and this process will be moderated by protégés' personal characteristics. Specifically, based on the Technology Acceptance Model (Davis et al., 1989; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000), this study explores the mechanism through which reverse mentoring influences older protégés' digital transformation support/resistance by enhancing their digital literacy, thereby changing their perceptions of digital technology usefulness and ease of use, and examines the moderating role of older protégés' downward learning mindset in the above relationships. The theoretical model of Study 2 is shown in Figure 2 [Figure 2: see original paper].

First, reverse mentoring helps enhance older protégés' digital literacy. Digital literacy refers to individuals' awareness, knowledge, skills, and abilities to work with digital technologies (such as IoT, big data, artificial intelligence, etc.) (Scuotto et al., 2021; Zahoor et al., 2023). Existing research shows that digital literacy is crucial for individuals to adapt to digital technology transformation and achieve good performance (Cetindamar et al., 2021; Mohammadyari & Singh, 2015). In reverse mentoring practice, younger mentors sharing cutting-edge technology knowledge and new-generation insights with older protégés is the most fundamental core function (Harvey et al., 2009). Younger mentors providing career support by imparting digital technology knowledge can help older protégés better overcome technical obstacles, thereby enhancing their adapt-

ability to new technology changes; simultaneously, younger mentors alleviating older protégés' pressure from technology changes through encouragement and emotional support in interactions enhances their confidence and willingness to adapt from a psychological perspective; additionally, younger mentors providing intuitive role modeling through behavioral examples of digital technology application stimulates older protégés' motivation to learn and apply new technologies. These career support, psychological support, and role modeling related to digital technology changes all help enhance older employees' digital literacy (Zahoor et al., 2023). Although there is no relevant empirical evidence to date, two case studies in the education field have reported positive results (Cotugna & Vickery, 1998; Leh, 2005). In Cotugna and Vickery' s (1998) study, college students taught network skills to paired professors. Professors reported that they were comfortable in this role and their network skills improved significantly. In Leh' s (2005) study, graduate students were paired with teachers to support their use of new technologies in the classroom, and the results also met expectations. In summary, we propose:

Proposition 1: Reverse mentoring has a positive impact on older protégés' digital literacy.

Furthermore, as older protégés' digital literacy is enhanced through reverse mentoring practice, their perceptions of the usefulness and ease of use of new digital technologies will also change. Usefulness and ease of use are core concepts of the Technology Acceptance Model. Perceived usefulness refers to the degree to which an individual believes that using a technology will help improve their performance, while perceived ease of use refers to the degree to which an individual believes that using the technology will be effortless (Elkaseh et al., 2016; Kamal et al., 2020). The Technology Acceptance Model posits that perceptions of technology usefulness and ease of use are the most common and important determinants of technology acceptance, directly influencing individuals' intention to use and actual use behavior (Venkatesh & Davis, 2000). However, individuals' perceptions of technology usefulness and ease of use are not spontaneously formed but are influenced by various factors. Initially, the Technology Acceptance Model emphasized that external factors, such as technology or system design features, affect individuals' judgments of technology usefulness and ease of use (Davis et al., 1989). With the evolution of the model, individual factors, especially self-efficacy and technology trust, have also been proven to play important roles in the formation of usefulness and ease of use perceptions (Zhang Liyi, Zhang Ran, 2015). Specifically, individuals with higher digital literacy are usually more sensitive to new technologies, have stronger absorption capacity, and have greater confidence in their own technical abilities (Neumeyer & Liu, 2021; Neumeyer et al., 2021), which directly enhances their technology self-efficacy. Additionally, improved digital literacy enables older employees to better understand the potential value of new technologies, thereby increasing their trust that new technologies can bring work efficiency improvements and performance enhancements (Mohammadyari & Singh, 2015). Therefore, based on the Technology Acceptance Model, the enhancement of digital literacy signif-

icantly improves older employees' perceptions of technology usefulness and ease of use by strengthening their self-efficacy and technology trust. In summary, we propose:

Proposition 2a: Older protégés' digital literacy has a positive impact on their perceived usefulness of digital technology.

Proposition 2b: Older protégés' digital literacy has a positive impact on their perceived ease of use of digital technology.

At the work level, digital transformation means the application of new digital technologies such as IoT, big data, artificial intelligence, robotics, cloud computing, 3D printing, augmented reality, or virtual reality in work (Nambisan, 2017). This transformation requires employees to subjectively recognize the value of digital transformation. On one hand, when employees believe that adopting new technologies can help them better complete work tasks and improve performance, they will develop stronger supportive attitudes toward digital transformation and be willing to view it as an opportunity for personal growth and development (Zhou Qiwei et al., 2024). On the other hand, when employees believe that learning new technologies is less difficult and operationally simple and easy, they will reduce their psychological resistance to transformation change and be more inclined to participate in digital skill learning and practice. Therefore, perceptions of digital technology usefulness and ease of use not only affect employees' attitudes toward digital transformation but also provide psychological driving force for practical adaptation, promoting the transformation process of skill learning and behavioral adaptation for older employees. In summary, we propose:

Proposition 3a: Older protégés' perceived usefulness of digital technology has a positive (negative) impact on their support (resistance) for digital transformation.

Proposition 3b: Older protégés' perceived ease of use of digital technology has a positive (negative) impact on their support (resistance) for digital transformation.

The extent to which reverse mentoring can enhance older protégés' digital literacy depends on how older protégés view and whether they are willing to humble themselves and seek guidance from younger juniors (Garg et al., 2021). To this end, this study examines the moderating role of older protégés' downward learning mindset. Downward learning mindset refers to individuals' belief that they can learn valuable knowledge from people with lower status, less experience, or younger age than themselves and their willingness to learn downward (Zhang et al., 2023). This construct profoundly embodies the ancient Chinese learning philosophy of "When three people walk together, there must be one who can be my teacher." Research shows that in traditional mentoring, mentors with a downward learning mindset are more willing to participate in mentoring programs, which helps improve protégés' learning performance (Zhang et al., 2023). Due to reverse mentoring' s special power structure, this study believes that

whether older protégés possess a downward learning mindset is particularly important for the success of reverse mentoring. In reverse mentoring, protégés hold higher status and power in the organization. Getting them to acknowledge their own shortcomings and learn from younger, less senior colleagues is itself a huge challenge (Argyris, 1991; Pfrombeck et al., 2024). As a senior executive protégé at Procter & Gamble said: "In reverse mentoring, you become a student again. This is a bit difficult for some of us because we are used to managing organizations of up to 20,000 people and giving orders" (Solomon, 2001). Therefore, if older protégés do not have the mindset of being unashamed to learn from those below and not feeling inferior to ask questions, they will find it difficult to learn new digital technologies from younger mentors through reverse mentoring and truly improve their own digital literacy (Meister & Willyerd, 2010). In summary, we propose:

Proposition 4: Older protégés' downward learning mindset positively moderates the relationship between reverse mentoring and older protégés' digital literacy. When older protégés have a stronger downward learning mindset, this positive effect is stronger.

3.3 Study 3: Mechanism of Reverse Mentoring's Influence on Younger Mentors' Digital Transformation Adaptability

From literature review, we know that the biggest problem young employees face in enterprise digital transformation is insufficient participation motivation. This is because young employees usually have shallow seniority and lower status, playing more of an executor role in digital transformation. This secondary, auxiliary positioning cannot meet the personality requirements of new-generation employees, leading them to easily adopt an indifferent and passive attitude toward transformation change (Weeks & Schaffert, 2019). If employees hold negative attitudes toward digital transformation, they may be less willing to actively learn and apply new technologies. Therefore, understanding how reverse mentoring influences younger mentors' degree of support/resistance to digital transformation is key to resolving resistance from young employees and enhancing their digital transformation adaptability.

From the perspective of needs satisfaction, this study proposes that reverse mentoring can satisfy younger mentors' core needs for motivational incentives, thereby influencing their attitudes toward digital transformation, and this process is also moderated by mentors' personal characteristics. Specifically, based on Self-Determination Theory (Deci & Ryan, 2000), this study proposes a mechanism through which reverse mentoring influences younger mentors' digital transformation support/resistance reactions by satisfying their autonomy, competence, and relatedness needs in digital transformation, thereby enhancing their digital transformation commitment, and examines the moderating role of younger mentors' new-generation work values in the above relationships. The theoretical model of Study 3 is shown in Figure 3 [Figure 3: see original paper].

Self-Determination Theory posits that the social environment individuals are in influences their attitudes and behaviors by satisfying their basic psychological needs (Deci et al., 1989; Yang Chen et al., 2018). As an important motivational theory, basic psychological needs satisfaction is considered to be at the core of motivational incentives (Burmeister et al., 2020). The basic psychological needs here include three types: autonomy need, competence need, and relatedness need (Deci & Ryan, 2000). Among them, autonomy need refers to the sense of will and psychological freedom that individuals desire to feel when interacting with the work environment, emphasizing individual choice and the expectation of being able to control their own behavior; competence need refers to individuals' desire to feel effective in their interaction with the environment; and relatedness need refers to individuals' desire to maintain connections and establish close relationships with others at work (Burmeister et al., 2020; Yang Chen et al., 2018). Psychological needs are universal, meaning that different individuals in different cultures all have these needs (Deci et al., 2001; Gagné & Deci, 2005). But at the same time, psychological needs also have domain specificity, meaning that domain-specific psychological need satisfaction that individuals experience in specific domains affects their motivation to pursue further activities in that domain (Deci & Ryan, 2008; Milyavskaya et al., 2014). Based on this, this study explores the impact of reverse mentoring on younger mentors' psychological needs satisfaction in the digital transformation domain.

First, reverse mentoring helps promote younger mentors' autonomy need satisfaction in digital transformation. Previous research shows that young employees with relatively limited work experience tend to view themselves as knowledge recipients (Burmeister et al., 2018). However, in reverse mentoring, younger mentors need to decide how to impart new digital technology knowledge to their older protégés, which provides young employees with opportunities to exercise personal will, because imparting knowledge is a discretionary behavior that allows individuals to experience full autonomy and impact on others (Bartol et al., 2009; Cabrera et al., 2006). In this process, career support enhances younger mentors' recognition of their own career value by creating practical platforms for career development, such as teaching guidance and actual problem-solving opportunities. Psychological support is manifested as younger mentors gaining trust and recognition from older protégés by helping them overcome technology adaptation barriers in mentor-protégé interactions, and this positive feedback further consolidates younger mentors' self-efficacy and autonomy experience. Meanwhile, role modeling also plays a motivational role, as younger mentors set examples for team members through successful guidance experiences, thereby strengthening their autonomy need satisfaction.

Second, reverse mentoring helps promote younger mentors' competence need satisfaction in digital transformation. Reverse mentoring provides younger mentors with opportunities to utilize their digital knowledge, allowing them to demonstrate competence and gain value recognition in front of higher-status colleagues (Cohen, 2003). When young employees have opportunities to utilize their existing knowledge and skills, they often feel competent and satisfied at work

(Canning, 2011). Specifically, career support broadens younger mentors' knowledge domains through technical training and cross-level exchange opportunities, while providing practical feedback for their competence development. Psychological support is manifested as younger mentors gaining positive evaluation and trust from older protégés when helping them cope with technology challenges, and this emotional support further enhances younger mentors' confidence in their own professional competence. Additionally, role modeling consolidates younger mentors' technical authority image by prompting them to demonstrate high-level professional behaviors in technology application, thereby significantly enhancing their perceived competence need satisfaction.

Finally, reverse mentoring helps promote younger mentors'relatedness need satisfaction in digital transformation. Through reverse mentoring, young employees have opportunities to establish connections with older colleagues and even management personnel, express their own insights on digital transformation to them, thereby greatly expanding their personal networks and relationship networks (Hewlett et al., 2009). Additionally, to successfully conduct intergenerational knowledge transfer, both mentors and protégés need to engage in high-quality communication and make high-level commitments to developing mutual relationships (Burmeister et al., 2015; Kwan & Cheung, 2006), which also helps generate positive socio-emotional experiences, thereby satisfying younger mentors' relatedness needs. For example, by providing career-related guidance and technology application advice to older protégés, younger mentors establish cross-level cooperative relationships based on knowledge transfer with older protégés and thereby expand their own personal networks. Psychological support is reflected in younger mentors helping older protégés overcome anxiety when facing digital transformation through continuous emotional encouragement and spiritual support, which helps form positive emotional connections and trust relationships between mentors and protégés. This high-quality emotional interaction enhances younger mentors' sense of belonging and social connection. Role modeling, through younger mentors demonstrating their digital technology application capabilities, provides practical examples for older protégés. This not only enhances mentors' own team influence but also motivates them to be more proactive and active in knowledge sharing and relationship building, ultimately promoting relatedness need satisfaction. In summary, we propose:

Proposition 5a: Reverse mentoring has a positive impact on younger mentors' autonomy need satisfaction in digital transformation.

Proposition 5b: Reverse mentoring has a positive impact on younger mentors' competence need satisfaction in digital transformation.

Proposition 5c: Reverse mentoring has a positive impact on younger mentors' relatedness need satisfaction in digital transformation.

Furthermore, as younger mentors' psychological needs in digital transformation are satisfied through reverse mentoring practice, their participation motivation for digital transformation will also change. Here, this study focuses on individ-

uals' digital transformation commitment. It is generally believed that young employees represented by Generation Z have distinctive characteristics such as focusing on experiences, having distinct personalities, wide-ranging interests, and desiring recognition. In organizations dominated by older employees, if their advantages are not utilized and contributions are not recognized, they are prone to negative behaviors such as "lying flat" and "letting things slide." Therefore, to attract young employees to actively participate in organizational affairs, taking measures to stimulate their intrinsic commitment is key. Digital transformation commitment is not only reflected in individuals' positive evaluation of digital transformation but also includes the behavioral intention to actively adapt to digital transformation, actively support digital transformation, and be willing to make efforts for the success of digital transformation (Fedor et al., 2006; Herold et al., 2007). Therefore, high digital transformation commitment indicates employees' strong motivational state for participating in digital transformation (Conway et al., 2015), echoing the problem of insufficient motivation among young employees in enterprise digital transformation.

Younger mentors' psychological needs satisfaction in digital transformation positively affects their digital transformation commitment because Self-Determination Theory clearly states that environmental factors (such as reverse mentoring) affect motivation states through basic psychological needs. When individuals' basic psychological needs are satisfied, their intrinsic motivation and sense of participation are strengthened (Deci et al., 2017). Specifically, first, when younger mentors' autonomy need is satisfied in digital transformation, it means they can experience a sense of control in digital transformation (Ryan & Deci, 2008) and feel that their voice can be "heard" (Twenge, 2006). This sense of control enhances their participation motivation in transformation and improves their identification with transformation goals. According to Self-Determination Theory, autonomy satisfaction is closely related to enhanced intrinsic motivation. Younger mentors will therefore be more actively engaged in digital transformation and exhibit higher commitment and sustained participation in the process (Deci & Ryan, 2000). Second, when younger mentors' competence need is satisfied in digital transformation, they will feel that their contributions are recognized and obtain opportunities for further development on this basis. According to Self-Determination Theory, enhanced competence feeling is also a powerful factor in stimulating individuals' intrinsic motivation (Deci & Ryan, 2000). In the digital transformation process, the manifestation and enhancement of younger mentors' technical and leadership capabilities will give them more confidence and make them feel that their role in transformation is crucial. This positive feedback makes younger mentors develop stronger commitment and sense of responsibility toward digital transformation, willing to invest more effort and resources to promote transformation success. Finally, when younger mentors' relatedness need is satisfied in digital transformation, they will feel that their connections with the team and organization are closer, enhancing their sense of belonging to the team and organization (Baard et al., 2004). In digital transformation, good

cooperative relationships can enhance employees' social support systems to cope with the insecurity and many challenges brought by transformation (Van den Broeck et al., 2016). According to Self-Determination Theory, intrinsic motivation is more likely to flourish in environments characterized by security (Ryan & La Guardia, 2000). Therefore, after experiencing organizational and colleague support, younger mentors will be more willing to actively participate in the transformation process and exhibit stronger commitment and long-term investment in digital transformation. In summary, we propose:

Proposition 6a: Younger mentors' autonomy need satisfaction in digital transformation has a positive impact on their digital transformation commitment.

Proposition 6b: Younger mentors' competence need satisfaction in digital transformation has a positive impact on their digital transformation commitment.

Proposition 6c: Younger mentors' relatedness need satisfaction in digital transformation has a positive impact on their digital transformation commitment.

Younger mentors' digital transformation commitment positively affects their support for digital transformation and negatively affects their resistance to digital transformation. As a commitment to a specific domain, digital transformation commitment has higher predictive power for individuals' attitudes and behaviors in the digital transformation domain (Van den Broeck et al., 2016). Specifically, from the connotation of digital transformation commitment, we can see that it not only includes individuals' positive evaluation of digital transformation but also includes behavioral intention to pursue transformation success (Fedor et al., 2006; Herold et al., 2007). Therefore, it can be expected that employees with higher digital transformation commitment will be more supportive of enterprise digital transformation and less likely to resist it. In digital transformation practice, young employees' supportive attitudes do not simply remain at the cognitive level but will be transformed into actual adaptive behaviors. This behavioral adaptation can be reflected in young employees proactively imparting digital skills to their older colleagues, sharing practical experience in technology application, or promoting the achievement of transformation goals by providing technical help in teams. In summary, we propose:

Proposition 7: Younger mentors' digital transformation commitment has a positive (negative) impact on their support (resistance) for digital transformation.

The extent to which reverse mentoring can satisfy younger mentors' psychological needs in digital transformation depends on how younger mentors view the opportunities provided by reverse mentoring. Reverse mentoring provides young employees with platforms to demonstrate and enhance themselves, make immediate contributions, exert upward influence, and establish good interpersonal relationships (Hewlett et al., 2009), which caters to the mainstream portrayal of new-generation employees' work values in intergenerational difference literature (Tang et al., 2017; Hou Xuanfang et al., 2014). Therefore, this study

examines the moderating role of younger mentors' new-generation work values. Work values refer to individuals' preferences for work choices and cognition of work principles, ethics, and beliefs. It is an internal ideological system that directly influences behavior (Hou Xuanfang et al., 2014; Li Yanping, Hou Xuanfang, 2012). Work values have significant intergenerational differences. It is generally believed that new-generation employees' work values include characteristics such as utilitarian orientation, intrinsic preference, interpersonal harmony, innovation orientation, long-term development, open-mindedness, and self-transcendence (Tang et al., 2017; Hou Xuanfang et al., 2014). These values make them committed to pursuing autonomy, sense of achievement, and meaning at work (Twenge et al., 2010; Westerman & Yamamura, 2006), and they value equality and fairness in interpersonal interactions (Shri, 2011). However, due to differences among younger mentors in age, early experiences, educational background, family conditions, etc., the degree to which each individual conforms to the new-generation work values prototype will also vary (Tang et al., 2017). Therefore, younger mentors who more closely conform to the new-generation work values prototype should value the opportunities provided by reverse mentoring more, because reverse mentoring caters to their intrinsic preferences. Correspondingly, they are more likely to experience psychological satisfaction from reverse mentoring in digital transformation. In summary, we propose:

Proposition 8: Younger mentors' new-generation work values positively moderate the relationship between reverse mentoring and younger mentors' psychological needs satisfaction in digital transformation. When younger mentors have stronger new-generation work values, this positive effect is stronger.

3.4 Study 4: Mechanism of Reverse Mentoring' s Influence on Organizational Digital Transformation Resilience

From literature review, we know that in the enterprise digital transformation process, organizational human resources as a whole, including younger mentors and older protégés, are prone to issues such as lacking transformation consensus, resulting in weak cohesion and difficulty in coping with setbacks and challenges during transformation (Saes et al., 2022; Yao et al., 2024). This is because the whole is not a simple sum of individuals. In extreme cases, even though each individual' s needs are satisfied, mutual coordination and collaboration are still required to achieve the organization' s strategic goals. Therefore, digital transformation has never been just a technology or motivation issue for a single person or certain people (Tabrizi et al., 2019); it also requires strategic coordination of human resources as a whole (Benitez et al., 2022). From the perspective of needs satisfaction, this study believes that reverse mentoring can satisfy the organization' s need for building transformation consensus, thereby influencing its digital transformation resilience, and this process is moderated by the nature of management practice. Specifically, based on Sensemaking Theory (Maitlis, 2005; Weick, 1993), this study proposes a mechanism through which reverse men-

toring influences organizational digital transformation resilience by enhancing organizational human resources' overall digital transformation strategic consensus, and examines the moderating role of management practice intensity in the above relationships. The theoretical model of Study 4 is shown in Figure 4 [Figure 4: see original paper].

Sensemaking Theory posits that people form cognition of the meaning of specific events by attending to, processing, and interpreting specific cues in the environment. Constructing the meaning of events triggers current or future action responses (Maitlis & Christianson, 2014). According to this theory, management practice, as an important channel for individuals to obtain organizational information (Rousseau & Greller, 1994), conveys important information to employees about organizational characteristics, values, goals, beliefs, and expected employee behaviors (Guzzo & Noonan, 1994). This information becomes important cues for employees to construct meaning. In reverse mentoring, younger mentors provide older protégés with career support, psychological support, and role modeling related to digital transformation, which not only helps older employees deepen their meaning cognition of digital transformation but also promotes younger employees' understanding of the necessity and strategic value of digital transformation.

First, career support enables older protégés to more intuitively recognize the necessity and long-term value of technology change for career development through digital technology training and trend guidance, while also allowing younger mentors to deepen their understanding of the value of technology change for organizations and individuals in the knowledge sharing process. Second, psychological support helps older employees alleviate anxiety brought by technology change and enhances their trust in and acceptance of organizational digital transformation through positive emotional exchange and mutual trust. Similarly, in the process of providing psychological support, younger mentors further strengthen their identification with transformation goals by observing older employees' gradual acceptance of technology change. Finally, role modeling provides older employees with specific learning examples by younger mentors demonstrating practical applications of digital technology, helping them understand how technology change promotes work efficiency and innovation capability. Meanwhile, younger mentors also become more clear about the significance of digital transformation for business practice and organizational development in this process, thereby enhancing their overall cognition of transformation goals. Through such two-way sensemaking, reverse mentoring practice provides organization members with broad and consistent information cues. Both older and younger employees can clearly sense the organization' s determination, beliefs, and values in implementing digital transformation from reverse mentoring practice. Based on the concept of shared perception, this consistent information prompts organization members to achieve collective understanding of digital transformation goals and meaning (Maitlis, 2005). When organization members generally recognize the necessity and meaning of digital transformation through reverse mentoring, it is easy to form organizational-level digital transformation strategic consensus,

that is, consistent recognition within the organization of digital transformation strategy and goals (Yao et al., 2024).

Additionally, in reverse mentoring, many older protégés themselves are in management positions responsible for formulating digital transformation strategic goals. On one hand, reverse mentoring enables them to learn cutting-edge digital technologies and application trends, enhancing their strategic insights into digital transformation (Harvey et al., 2009). On the other hand, it also gives leaders opportunities to listen to employees' viewpoints and expectations (Harvey et al., 2009), thereby formulating digital strategies and goals that employees can easily understand and accept. From younger mentors' perspective, on one hand, reverse mentoring allows them to voice their opinions and exert influence on the decision-making process (Meister & Willyerd, 2010; Twenge, 2006). On the other hand, in interactions with senior management, younger employees also gain deeper understanding of strategy and business (Meister & Willyerd, 2010). As understanding between older and younger employees and between senior management and frontline employees is enhanced through reverse mentoring, the organization' s overall digital transformation strategic consensus will also be significantly strengthened. In summary, we propose:

Proposition 9: Reverse mentoring has a positive impact on organizational digital transformation strategic consensus.

Furthermore, as organizational digital transformation strategic consensus is enhanced through reverse mentoring practice, this will significantly improve the organization' s digital transformation resilience. From a practical perspective, the enterprise digital transformation process is fraught with difficulties. How to enable enterprises to remain unbreakable when encountering difficulties, setbacks, and adversities, or even become stronger through setbacks, is crucial to the success of digital transformation. This study draws on literature in the organizational resilience field (Carmeli et al., 2013; Kennedy et al., 2016) and proposes the concept of digital transformation resilience, referring to an emergent state where the organization has the capability to cope with any failures, setbacks, conflicts, or other threats related to digital transformation. According to Sensemaking Theory, sensemaking of specific events helps actors make optimal investments in key resources, thereby helping them become more resilient (Weick et al., 2005; Liu Beini, Zhang Zhixue, 2023). Specifically, when organization members have strong strategic consensus on digital transformation, indicating that everyone generally recognizes digital transformation strategy and goals, this consistent recognition can coordinate key resources and collective actions to cope with uncertainty and risks and challenges. Meanwhile, when organization members share common values and goals, this also helps enhance organizational cohesion, making the organization more resilient when facing setbacks and difficulties in digital transformation (Welbourne & Paterson, 2017). In summary, we propose:

Proposition 10: Organizational digital transformation strategic consensus has a positive impact on its digital transformation resilience.

The extent to which reverse mentoring can enhance organizational human resources' overall digital transformation strategic consensus depends on the intensity of this management practice. According to Sensemaking Theory, the more unusual or significant an event is, the more it can attract people' s attention and enable sensemaking (Weick, 1995). Therefore, the intensity of reverse mentoring practice will affect its effectiveness. Management practice intensity refers to the degree to which management practice information is effectively transmitted and effectively perceived and recognized by employees (Bowen & Ostroff, 2004), usually including three dimensions: distinctiveness, consistency, and consensus. Among them, distinctiveness refers to the degree to which management practice information can attract members' attention and stimulate their interest; consistency refers to the degree to which the operation process of management practice has uniformity and can convey consistent information; consensus refers to the degree to which management practice information can generate a sense of universal recognition among members (Jia Jianfeng et al., 2017). First, regarding distinctiveness, when the reverse mentoring implemented by the organization has broader scope, larger scale, and spans more levels, it indicates that the practice is more unusual and can accordingly attract more people' s attention and importance, thereby generating greater impact. Second, regarding consistency, when reverse mentoring is executed more uniformly across different mentor-protégé relationships and the information conveyed by reverse mentoring is more consistent with other management practices, it can deepen people' s understanding of the information that reverse mentoring aims to convey. Finally, regarding consensus, when reverse mentoring can generate universal recognition among people, it means that people generally recognize the goals and philosophy of reverse mentoring (Hauff et al., 2017; Jia Jianfeng et al., 2021), and accordingly will also generate higher commitment to its goals and philosophy. In summary, we propose:

Proposition 11: Management practice intensity positively moderates the relationship between reverse mentoring and organizational digital transformation strategic consensus. When practice intensity is higher, this positive effect is stronger.

4 Theoretical Construction

Currently, a large number of enterprises are actively planning and promoting digital transformation, but they universally face the problem of personnel resistance, leading to transformation often failing due to lack of internal support. Older employees, younger employees, and the organization as a whole have different shortcomings and needs in transformation, mainly manifested as older employees' digital literacy urgently needing improvement, younger employees' participation motivation needing stimulation, and the organization' s overall transformation consensus being difficult to build. The failure to satisfy these unique needs is the fundamental cause of personnel resistance. From the perspective of Maslow' s hierarchy of needs, older employees need to improve technology

adaptation capabilities to maintain work efficiency and job security, which aligns with the definition of physiological and safety needs; while younger employees' desire to take greater responsibility and exert greater influence in transformation belongs to the category of esteem and self-actualization needs; the organization needs to enhance cohesion by promoting intergenerational collaboration to better satisfy employees' belonging needs in transformation. Although these needs are different, they are not isolated but intertwined and mutually supportive in the transformation process. Reverse mentoring enables young employees to serve as "mentors" and impart cutting-edge technology knowledge to older employees, which not only helps older employees overcome technical shortcomings but also enhances younger employees' sense of responsibility and participation, thereby simultaneously satisfying the differentiated needs of both mentors and protégés. In this process, intergenerational communication and understanding are enhanced, thereby promoting employees' sense of belonging and improving overall organizational cohesion. Therefore, the perspective of differentiated needs satisfaction provides an integrated theoretical framework for this study, helping us better understand the internal mechanism of reverse mentoring in resolving digital transformation personnel resistance.

Specifically, this study first clarifies the three core functional dimensions of reverse mentoring—career support, psychological support, and role modeling—and updates their unique connotation in the digital transformation context. Based on this, we construct a systematic theoretical framework covering individual and organizational level influence paths, deeply revealing how reverse mentoring comprehensively enhances enterprises' adaptability in digital transformation by satisfying the differentiated needs of older protégés, younger mentors, and organizational human resources as a whole. This internal logic not only clarifies the structural connotation of reverse mentoring but also provides theoretical support and practical guidance for solving complex management problems in digital transformation. Through systematic connotation analysis and mechanism exploration, this study provides an integrated theoretical construction for how reverse mentoring can help enterprises cope with digital transformation challenges.

First, this study expands the structural connotation of reverse mentoring and develops measurement tools adapted to the digital transformation context, laying the foundation for subsequent empirical research. Although reverse mentoring has gradually attracted attention from management scholars in recent years, its core functions such as career support, psychological support, and role modeling have been preliminarily defined (Murphy, 2012), these studies have mostly focused on discussions of its general functions, lacking in-depth exploration of specific application contexts, especially in organizational contexts driven by digital technology change. This study closely focuses on the specific context of digital transformation, combines the realistic background of enterprises coping with technology iteration and intergenerational knowledge flow, and redefines the functional dimensions of reverse mentoring from an enterprise practice perspective. For example, career support emphasizes cross-generational transfer of

digital technology knowledge and technology development trends; psychological support further focuses on helping older employees alleviate anxiety and self-efficacy deficiency brought by digital transformation; role modeling highlights younger mentors providing behavioral benchmarks for older protégés to learn and adapt to new digital technologies through technology application examples. This contextualized definition not only enriches and develops the conceptual connotation of reverse mentoring but also reveals its unique value in the digital context. Additionally, this study develops reverse mentoring measurement tools for digital transformation scenarios through rigorous qualitative research procedures, laying a solid foundation for subsequent empirical research and promoting the application and development of reverse mentoring in the new era context.

Second, this study deeply explores the impact of reverse mentoring on older protégés' and younger mentors' digital transformation adaptability to reveal its effectiveness and mechanism at the individual level. As direct subjects of the mentoring relationship, older protégés and younger mentors exhibit obvious differentiated needs under the digital transformation process. Understanding the impact of reverse mentoring on them is key to revealing its functional logic. For older protégés, reverse mentoring enhances their acceptance willingness of new technologies by providing technical guidance and improving their digital literacy. This needs satisfaction path can be theoretically explained by relying on the Technology Acceptance Model (TAM) (Davis et al., 1989). Additionally, reverse mentoring requires older employees to seek guidance from younger, less senior mentors. This role reversal poses requirements for older employees' downward learning mindset. Downward learning mindset, as a key moderating variable, may affect older protégés' adaptation process and learning effectiveness (Zhang et al., 2023). For younger mentors, reverse mentoring can promote their commitment to and adaptation to digital transformation by satisfying basic psychological needs such as autonomy, competence, and relatedness, which centrally embodies the internal logic of Self-Determination Theory (SDT) (Deci & Ryan, 2000). Meanwhile, whether younger mentors value the opportunities provided by reverse mentoring to demonstrate and enhance themselves, make immediate contributions, exert upward influence, and establish good interpersonal relationships (Hewlett et al., 2009) will affect the effectiveness of reverse mentoring. To this end, this study introduces value congruence as a key moderating variable to explore its boundary effects in the influence path. Thus, this study reveals the internal mechanism of reverse mentoring enhancing enterprise digital transformation adaptability from the individual level, not only deepening the theoretical explanation of reverse mentoring' s core functions but also providing important guidance for individual management practice in enterprise digital transformation.

Finally, this study clarifies the internal mechanism through which reverse mentoring enhances organizational digital transformation resilience, extending the aforementioned effects to the organizational level. This extension is very necessary. On one hand, reverse mentoring, as an innovative management practice

that disrupts traditional power structures, its effects are not limited to the direct subjects of the mentoring relationship but also produce far-reaching radiating effects at the overall organizational level; on the other hand, focusing solely on individual-level adaptive improvements is insufficient to cope with the complex challenges of digital transformation. Enhancing the overall digital resilience of organizational human resources is equally crucial. In the enterprise digital transformation process, the formation of overall organizational resilience depends not only on the optimal allocation of technical resources but also on cognitive consistency and strategic consensus among members (Saes et al., 2022; Yao et al., 2024). Based on Sensemaking Theory (Maitlis, 2005; Weick, 1993), this study proposes that reverse mentoring can effectively build strategic consensus by promoting cognitive resonance and action coordination among organization members during the transformation process, thereby enhancing the organization' s adaptive capacity to cope with change challenges. Additionally, management practice intensity plays an important moderating role in this process. By improving the implementation depth and consistency of reverse mentoring, practice intensity can significantly strengthen its shaping effect on organization members' cognition and behavior (Bowen & Ostroff, 2004). Thus, this study extends individual-level effects to the overall organizational level, comprehensively revealing the multi-level mechanism of reverse mentoring in the digital transformation context, providing systematic theoretical reference and practical guidance for enterprises to promote digital transformation.

5 Conclusion and Discussion

By constructing the above theoretical system, this study will make contributions in the following three aspects:

First is research content. Enterprise digital transformation is a hot topic in today' s era, receiving widespread attention from both theoretical and practical circles. The core of digital transformation lies in people. How to resolve resistance from internal personnel is both a challenge faced by management practice and an area with theoretical breakthrough potential. Current academic research in this field is still in its infancy. Scattered studies mainly focus on exploring how individuals themselves take actions to cope with pressure brought by digital transformation (Shi Yanwei et al., 2023; Zhou Qiwei et al., 2024), lacking discussion on what measures the organizational management level can take for effective intervention. Resolving digital transformation personnel resistance is a systematic project that requires scientific top-level design and overall planning. Addressing this urgent frontier research topic, this study innovatively proposes reverse mentoring as a "key" to solving the problem, focusing on exploring the effectiveness and mechanism of reverse mentoring in resolving personnel resistance in enterprise digital transformation, thereby building a bridge between the two important research fields of reverse mentoring and enterprise digital transformation, and providing new

Second is research perspective. Previous research on the effects of reverse

mentoring lacks an integrated theoretical analysis framework (Murphy, 2012), resulting in fragmented knowledge in this field, which is not conducive to the academic community forming regular understanding of management practice effects. Therefore, exploring the effectiveness and mechanism of reverse mentoring in resolving personnel resistance in enterprise digital transformation, and finding appropriate theoretical perspectives and analytical frameworks is key. Based on a comprehensive review of existing literature, this study innovatively proposes differentiated needs satisfaction as a problem-solving approach. Based on the Technology Acceptance Model, Self-Determination Theory, and Sensemaking Theory respectively, we construct a theoretical model wherein reverse mentoring influences digital transformation adaptability by satisfying the differentiated core needs of three key subjects (older employees, younger employees, and organizational human resources as a whole) in digital transformation, thereby providing an integrated perspective and unique insights for understanding this issue.

Finally is research methodology. As mentioned earlier, current research on reverse mentoring mainly focuses on conceptual discussion and case analysis, and relevant empirical evidence is still very limited (Murphy, 2012). This study plans to adopt a multi-method research strategy, combining literature research with field investigation, theoretical analysis with empirical analysis, and qualitative research with quantitative research as principles, and comprehensively using multiple research methods to conduct systematic exploration. Specifically, this study sorts out the theoretical foundation and research status of reverse mentoring through literature research to provide theoretical basis for constructing research models; through in-depth interviews, it excavates the practical characteristics of reverse mentoring in actual enterprises to provide field evidence for revising and improving the theoretical framework; through questionnaire surveys, it comprehensively collects data on reverse mentoring implementation effects to provide broad sample support for model validation; simultaneously, it combines field experiments to analyze the specific mechanism of reverse mentoring in the digital transformation context; and through case analysis, it further verifies the practical applicability of the theoretical model. The mutual supplementation and cross-validation of multiple methods can significantly enhance the reliability and explanatory power of research results. The methodological innovation of this study lies in breaking the limitations of single methods through comprehensive use of multiple research means, expanding new paths for reverse mentoring research, and laying a solid foundation for achieving major theoretical breakthroughs.

In addition to the above theoretical innovations, this study can also provide rich implications for enterprise management practice. On one hand, this study can provide scientific theoretical guidance for enterprise digital transformation. Currently, a large number of enterprises are actively planning and promoting digital transformation, but they always face the problem of personnel resistance, leading to digital transformation often failing due to lack of internal support. The reason lies in that enterprise managers have not truly achieved “people-oriented”

thinking, considering issues from the shortcomings and needs of different interest groups, and still implement change top-down with traditional management thinking, ultimately leading digital transformation into the embarrassing situation of being blocked everywhere. This study creatively proposes implementing reverse mentoring practice to resolve this problem, revealing its internal mechanism of action, thereby providing scientific theoretical guidance for enterprise digital transformation. On the other hand, this study can inspire enterprise managers to better utilize reverse mentoring practice. Although the concept of reverse mentoring has a long history in China, its application in modern enterprise management is far behind the West, which may be related to traditional Chinese culture' s emphasis on values such as "respect for hierarchy." From the practical experience of foreign enterprises, reverse mentoring indeed has special advantages in many aspects that traditional mentoring does not possess, which is well worth our learning and reference. Therefore, this study, based on the application scenario of enterprise digital transformation, deeply explores the characteristics, processes, and results of reverse mentoring, and can provide inspiration and reference for optimizing the local practice of reverse mentoring.

Although this study provides a systematic theoretical framework for the mechanism of reverse mentoring in the enterprise digital transformation context, future research can still update and improve the theory from other different perspectives to better promote relevant research on reverse mentoring in the new era. First, future research can focus on the internal dynamics and mechanisms of the mentor-protégé relationship in reverse mentoring. This study mainly explores the overall functions of reverse mentoring practice and its role in digital transformation, but lacks in-depth analysis of the specific operation mode of the mentor-protégé relationship, which is the core element. For example, how is trust between mentors and protégés established and maintained? How do intergenerational cognitive differences and communication preferences affect the efficiency of knowledge transfer? Additionally, the impact of different contexts (such as formal and informal mentoring relationships) on mentor-protégé interaction patterns is also worth further research. Through exploring key mechanisms such as trust building, communication patterns, and power dynamics in reverse mentoring relationships, future research can deepen understanding of the mentor-protégé interaction process, reveal key factors affecting its effectiveness, and thereby provide more targeted theoretical basis for the optimal design of reverse mentoring.

Second, future research should deeply explore the adaptability and implementation effects of reverse mentoring in different cultural contexts. Current understanding of the theoretical connotation and implementation effects of reverse mentoring is mainly constructed in Western cultural management contexts, but different cultural dimensions may significantly affect the operational logic of reverse mentoring. For example, in cultures with high power distance, are older employees willing to accept guidance from younger employees? Under collectivist culture, is intergenerational collaboration smoother? Additionally, cross-cultural research also needs to pay attention to differences in innovation ac-

ceptance, knowledge sharing motivation, and communication preferences across different societies. In-depth analysis of the impact of cultural variables on reverse mentoring can not only provide empirical support for its promotion in the globalization context but also help reveal the constraining effect of cultural adaptation mechanisms on this new management practice.

Finally, future research can further explore the potential synergistic effects between reverse mentoring and traditional mentoring. Although this study focuses on the unique functions of reverse mentoring, traditional mentoring still has irreplaceable value in vocational skill inheritance and enhancing organizational belonging (Harvey et al., 2009; Ivey & Dupré, 2022). In certain digital transformation scenarios, such as the initial stage of technology implementation or basic skill training stages, traditional mentoring can still provide support for new technology application through senior mentors' business experience and practical guidance. Of course, it should be recognized that the one-way knowledge transfer model of traditional mentoring makes it difficult to fully leverage younger employees' advantages in technology trends and innovation capabilities, unable to meet the needs of rapid technology iteration (Murphy, 2012). In contrast, reverse mentoring can bridge intergenerational technology gaps and enhance organizational adaptability to change through two-way interaction and intergenerational collaboration. Traditional and reverse mentoring each have applicable scenarios, and the combination of the two is expected to provide more comprehensive solutions. Future research can further explore the integration paths of the two models and their comprehensive impact on organizational performance, providing theoretical basis and practical guidance for talent management strategies in digital transformation.

Note: Figure translations are in progress. See original paper for figures.